DOCUMENT RESUME

ED 194 062 IR 008 915

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TITLE The Cognitive Effect in Bilingual Learners Given Different Pictorial Elaboration and Memory Tasks.
PUB DATE 23 Apr 80
NOTE 34p.; Paper presented at the Annual Convention of the Association for Educational Communications and Technology (Denver, CO, April 21-24, 1980). For complete proceedings of the Research and Theory Division, see IR 008 914.

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS Bibliographies; Bilingualism; *Bilingual Students; *Cognitive Measurement; Pictorial Stimuli; Spanish Speaking; Tables (Data); *Visual Aids

ABSTRACT

A research study was conducted to determine if incorporating different types of pictorial illustrations into a slide-tape instructional program would improve achievement scores and affect processing time of bilingual students when they were tested on different types of learning objectives. Fifty-four undergraduate bilingual students from a Puerto Rican university, who had a high degree of proficiency in the use of English but were native speakers of Spanish, were matched according to English proficiency scores and randomly assigned to one of six treatment conditions receiving externally paced audio-slide, English instruction complemented by one of three levels of pictorial elaboration (simple line drawings, simple line drawings with word labels, or word labels alone). Forty-eight hours later subjects received a self-paced, 80-item evaluation test measuring four different areas of cognitive knowledge (drawing, identification, terminology, and comprehension); subjects also recorded the amount of time spent interacting with each task test. Achievement scores indicated a significant pictorial elaboration test task interaction. Conclusions were also drawn about the processing time data. (Author/LLS)

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THE COGNITIVE EFFECT IN BILINGUAL LEARNERS GIVEN DIFFERENT PICTORIAL ELABORATION AND MEMORY TASKS

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Wednesday - April 23,1980

IR008915

ABSTRACT

Purpose

The purpose of this investigation was to assess the relative achievement effect and processing time of bilingual students for different types of pictorial elaboration complementing audio-slide English instruction when given different memory tasks in either of their respective proficient languages (Spanish and English).

Rationale

A literature review indicated that the selection process for incorporating visual stimuli into the bilingual instructional environment lacks supportive empirical evidence. Generally, it is believed that the use of visualized materials, when used to complement oral or print instruction, is not equally effective in facilitating acquisition or retrieval of concepts. However, there is little evidence assessing the additive effect of different levels of pictorial elaboration on bilingual student achievement nor the related issue of which proficient language would be most effective and efficient in evaluating the acquired information.

Method

The sample consisted of 54 undergraduate bilingual students from a Puerto Rican university, who have a high degree of proficiency in the use of English but are native speakers of Spanish. Subjects were matched according to English proficiency scores and randomly assigned to one of six treatment conditions receiving externally paced audio-slide, English instruction complemented by one of three levels of pictorial elaboration (simple line drawings, simple line drawings with word labels, or word labels). Forty-eight hours later subjects received a self-paced, 80-item evaluation test measuring four different areas of cognitive knowledge (drawing, identification, terminology, and comprehension) in Spanish or English; subjects also recorded the amount of time spent interacting with each task test.

ABSTRACT

Results

Factor analysis and Schaffe post-hoc comparisons were performed on the achievement scores and processing time data, respectively, for a .05 level of significance. Achievement results indicate a significant pictorial elaboration test task interaction with later post-hoc comparisons, indicating that the simple line drawings with word labels were superior for the drawing task. Significant main effects for longer response time were found for subjects receiving instruction by simple line drawings with word labels and for subjects receiving Spanish evaluation. Plausible theories of bilingual information processing are discussed.

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The Cognitive Effect in Bilingual Learners Given Different Pictorial Elaboration and Memory Tasks

Introduction

Although there is ample evidence substantiating that visual aids designed specifically to explain, clarify, and reinforce important concepts do facilitate learning (Carpenter & Greenhill, 1956; Lumsdaine & Sulzer,1951; VanderMeer, 1949), there is uncertainty as to the generalization of these findings,given current curriculum decisions and improved research design procedures (Torkelson, 1977). What has been evidenced suggests that pictorial illustrations can differentially affect learning (Dwyer, 1978), yet little is known about the effect of visualization on a bilingual population (Paulston, 1979). Indeed,the generalizability of the visual research on monlingual populations does not provide sufficient evidence for the following interrelated questions: (1) What type of pictorial materials should be used in teaching bilingual learners? (2) Are different types of pictorial elaboration equally effective? (3) What type of materials should be used for evaluating bilingual learners?

The research which has concentrated on the bilingual population has been limited to the linguistic or verbal aspects of memory (Lopez, 1972). Thus,the integration of these issues in a research investigation may produce relevant information that may help clarify the current controversies of single or dual processing and memory systems in bilingual students. This study,therefore,seeks to address these concerns,given the limited research base which integrates these multiple issues.

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Purpose of the Study

The purpose of the investigation was to assess the relative effect on Spanish dominant bilingual students of different types of pictorial elaboration with audio-slide English instruction given different evaluative measures in their respective proficient languages. Specifically, the investigation measured the achievement scores and the amount of retrieval time of bilingual learners given:

1. externally presented English audio-slide instruction containing a type of pictorial elaboration (pictures only, pictures and words, or words only); and
2. self-paced evaluation measures in Spanish or English requiring different memory retrieval (drawing, identification, terminology, and comprehension).

Review of the Literature

An extensive review of the literature (see Acevedo, 1980) found that although the use of visualized materials has increased greatly over the years (Carpenter, 1953; Dwyer, 1972; Gropper, 1966), empirical evidence providing guidelines for the incorporation of visual materials into the instructional environment needs further investigation (Torkelson, 1977). The primary conclusion from this investigative area has been that the use of visualized materials to complement oral/print instruction produces different levels of achievement dependent upon various instructional characteristics and environments (Dwyer, 1978). This conclusion appears

dependent upon the degree of realistic detail, method of presentation, student characteristics, type of evaluation, or other task features.

As used in the context of this study, pictorial elaboration (combinations of simple line pictures and word labels) attempts to facilitate learning of meaningful audio concepts by focusing the learner's attention on visual cues which would enhance their ability to extract the essential components of the presented information. Broadbent (1958, 1965) and Travers (1964, 1969) have suggested that too many irrelevant cues may actually compete for attention and subsequent information storage.

Further basis for the study was derived from investigations in human information processing and memory (Bower, 1972; Glanzer & Clark, 1963, 1964; Paivio, 1971). Research findings currently favor learners having a limited and selective information processing system and a dual (verbal and visual) memory system (Levie & Levie, 1975). Thus, structuring devices, such as codes for verbal and visual instruction, have been found to facilitate the encoding and decoding of concepts in what might otherwise be a complex task (Lamberski, 1980). However, evidence as to how these processes take place in the bilingual person has not been thoroughly investigated (McCormack, 1977). The emphasis on research dealing with memory and the bilingual student has been directed towards the linguistic components as opposed to the visualizing aspects (Kolers, 1963; Lopez, 1972, 1977; Rose, Rose, King, & Perez, 1975).

The authors hypothesized that the use of varying degrees of pictorial elaboration in relevant verbal and visual materials would produce differentiated achievement scores for Spanish dominant college learners.

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Based on the literature, it was also hypothesized that the learners would perform better on the evaluative measures in the language of presentation (English).

Summary of the Methods

There were fifty-four Spanish dominant bilingual subjects who voluntarily participated in the investigation. All were enrolled in an undergraduate program of study at the Inter-American University of Puerto Rico. The students who participated demonstrated a moderate to high degree of proficiency in the use of the Spanish and the English languages (Acevedo, 1980, pp. 41-42).

An externally paced audio-slide instructional unit, adapted from Dwyer and Lamberski (1977/1980), was developed for the study. The concepts and processes conveyed in the twenty-one slide presentation, with accompanying 18 minute English audio-taped narration (see Acevedo, 1980, pp. 108-116), were on the human heart. A simple line drawing of the heart was used as the illustrative base for use with or without word labels; the word lables would also be used by themselves (see Appendix A). Thus, three versions of the presentation were prepared, identical in content except that one presentation had simple line pictures only for the illustrative component, the second had simple line pictures and word labels (see Acevedo, 1980, pp. 86-107), and the third had word labels only. Together, the three instructional presentations constituted one experimental factor - pictorial elaboration.

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Two versions (English and Spanish) of an 80-item self-paced evaluative measure (see Acevedo, 1980, pp. 117-127), adapted from Dwyer and Lamberski (1977/1980), were also developed. Together, the two test versions constituted another experimental factor - language of evaluation. Both evaluative measures were identical in content, the difference being the language in which they were written. Each evaluative measure was divided into four task tests, each of which measured a different proportion of verbal or visual recall and application. The drawing test required the learner to draw a simple line drawing of the heart, labeling the drawing with twenty concept words which were provided. The identification test required the learner to recognize twenty numbered visual attributes of a provided simple line drawing of the heart. Each numbered visual attribute had a corresponding test item containing five multiple-choices. The terminology test required the learner for each of twenty items to complete a statement with a missing concept. For each of the twenty items, the learner was to select a concept word from a provided five-choice response list. The comprehension test consisted of twenty items which included a question or statement relating to a complex process of the heart. For each item the learner was required to select from a provided four-choice response list a concept word or function which related to the process. Distracter concepts (concepts not found in the instructional presentation)were added to some multiple-choice responses in the task tests. The four task tests constituted the third experimental factor - type of task test.

Experimental procedures for the investigation included three sessions. For the first experimental session, subjects reported to a central location

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where they were administered a 50-item English Proficiency Pretest.[1] At completion of the English Proficiency Pretest, subjects were matched by language proficiency and randomly assigned to one of six treatment groups (see Figure 1).

For the second experimental session, subjects reported to three separate treatment rooms, dependent upon their random-matched assignment. They were administered a 36-item, Physiology Pretest (see Dwyer, 1972, pp. 133-138) which measured prior biological knowledge of human anatomy and bodily functions. Later, they received one of three externally paced instructional presentations.

After forty-eight hours, subjects reported for the third experimental session to one of two assigned evaluation rooms (dependent upon their random-matched assignment), where they received the self-paced drawing test in Spanish or English. Upon completing and handing in the drawing test, the remaining self-paced evaluation tests (identification, terminology, and comprehension) were given to each subject. Starting time and completion time for all four tests were recorded by the subjects on a provided time card.

Research Design

The design chosen to test treatment conditions was an adaptation of the posttest-only, multiple treatment design, as described by Campbell and

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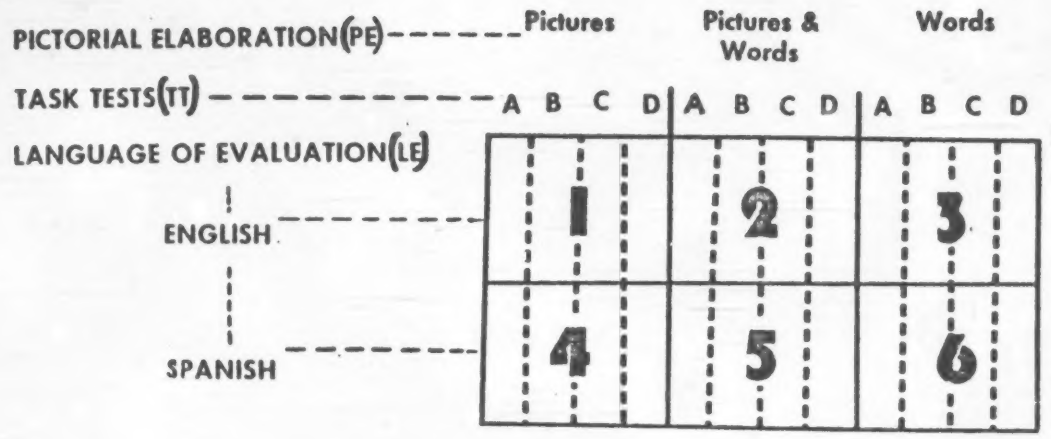
[1] King, H.V., & Campbell, R.N. An English Reading Test for Students of English as a Foreigh Language. Portland, Oregon: English Language Services, 1975.

FACTORS



Note: Subjects were ranked from high to low by proficiency scores from an English ability test where upon the subjects were randomly assigned to one of six treatment conditions 1,2,3,4,5,6 as matched on their proficiency scores.

FIGURE 1 OVERALL RESEARCH DESIGN.

Stanley (1966). This design insures control over many irrelevant variables which may cause systematic bias and minimizes threats to internal and external validity (Myers, 1966).

The investigation manipulated three independent variables in examining the dependent achievement data (number of correct responses for each of the four task tests). Independent variables in this analysis were type of pictorial elaboration (pictures only, pictures and word labels, and word labels only); language of evaluation (English or Spanish); and type of evaluative measure (drawing test, identification test, terminology test, and conprehension test).

The investigation also manipulated two independent variables in examining the dependent task time data (amount of time required to interact with all of the four tests). Independent variables in this analysis were type of pictorial elaboration received (pictures only, pictures and word labels, and word labels only) and language of evaluation (English or Spanish).

Minimum significance level was .05 for all a priori and post-hoc mean comparisons.

Two separate 2 x 3 factorial analyses were performed on the English Proficiency Pretest and the Physiology Pretest data to determine if subject mortality which occurred after matched randomization to treatment conditions resulted in cell bias. Results (see Acevedo, 1980, pp. 41-45) indicated subjects (n = 54) remaining within unequal cell conditions contained no significant differences on these two indices.

Hypotheses and Results

The hypotheses for the learner achievement data (number of correct item responses for each of the task tests) were analyzed using a 2 x 3 x (4) mixed factorial analysis of variance for repeated measures with subsequent post-hoc mean comparisons. The factorial analysis represented in Table 1 and illustrated in Figure 2 is based upon the means and standard deviations for the treatment groups found in Appendix B. Diagnostic data and Hoyt's Estimate of Reliability for the individual tast tests has been provided in Appendix D.

The hypotheses and results are as follows.

Hypothesis 1. Spanish dominant bilingual learners who receive an English audio-slide presentation containing pictorial elaboration of simple line pictures with word labels will obtain significantly greater achievement means on the four criterion measures given in English or Spanish than Spanish dominant bilingual learners who receive the identical presentation containing pictorial elaboration of pictures only or of words only.

The two-way interaction between task test and pictorial elaboration was less than a .01 level of significance. This implies that while pictorial elaboration does not significantly affect each mean difference for respective treatment conditions, it may affect one or more of the task test comparisons. Post-hoc mean comparisons further substantiated this finding (see Table 2) for the drawing test. Mean achievement scores for the respective treatment groups on the four tasks indicated that the criterion measures assessed different levels of content recall and application and may reflect varying degrees of task difficulty.

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TABLE 1

ANALYSIS OF VARIANCE OF CRITERION MEASURE SCORES FOR TREATMENT GROUPS

Source of Variation	df	Mean Square	F	Probability
Language of Evaluation (LE)	1	21.93	0.42	0.52
Pictorial Elaboration (PE)	2	50.23	0.97	0.39
LE x PE	2	59.84	1.16	0.32
Residual	48	51.74		
Task Test (TT)	3	96.27	16.32*	0.01
TT x LE	3	11.19	1.90	0.13
TT x PE	6	15.46	2.62*	0.01
TT x LE x PE	6	3.38	0.57	0.75
Residual	144	5.90		

*p <.05

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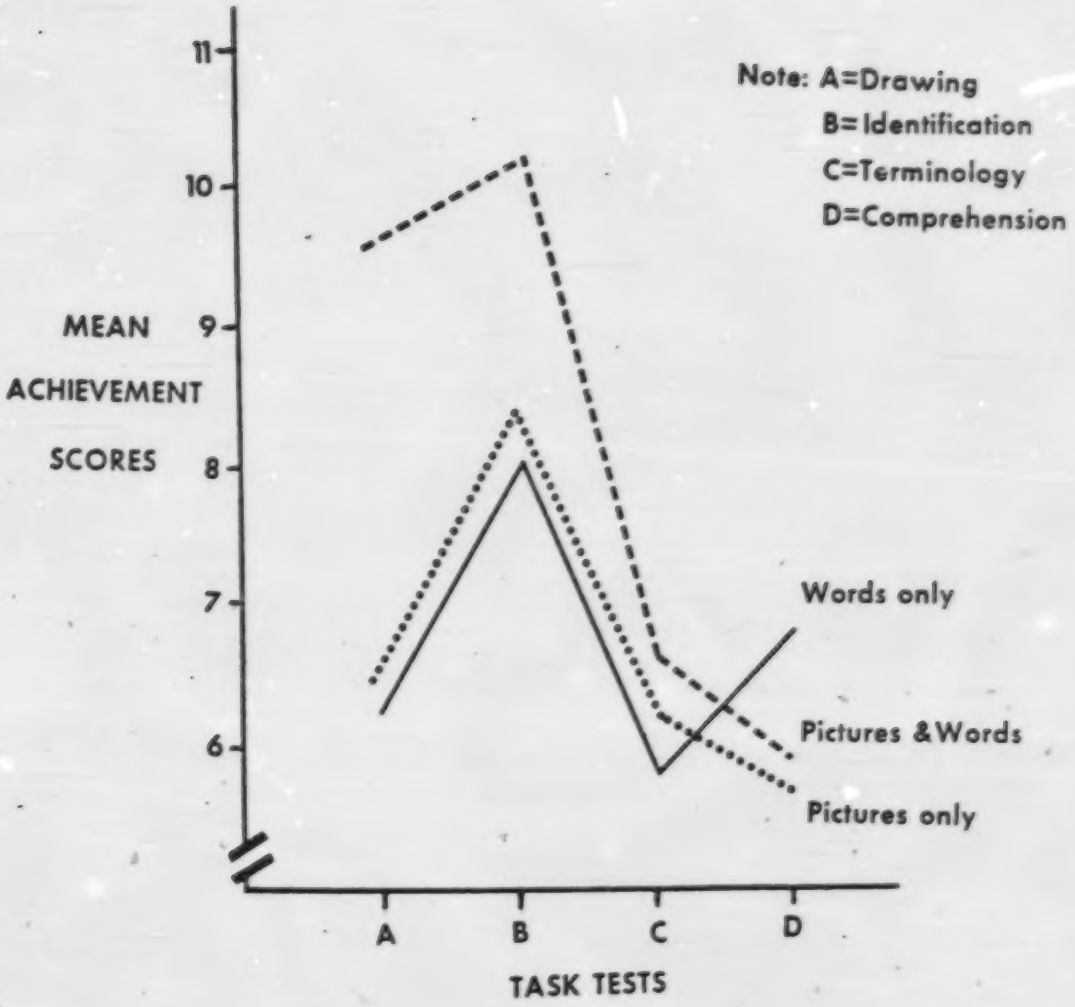

FIGURE 2 PLOT OF MEAN SCORES VERSUS CRITERION MEASURES FOR TYPES OF PICTORIAL ELABORATION

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TABLE 2

SCHEFFÉ'S MEAN SCORE COMPARISONS FOR PICTORIAL ELABORATION ON CRITERION MEASURES

PE Mean Comparisons	Drawing	Identification	Terminology	Comprehension
$PE_{(1+4)}$ vs $PE_{(2+5)}$	F=7.53*	F=2.51	F=0.05	F=0.05
$PE_{(1+4)}$ vs $PE_{(3+6)}$	F=0.18	F=0.02	F=0.02	F=0.85
$PE_{(2+5)}$ vs $PE_{(3+6)}$	F=8.86*	F=3.14	F=0.54	F=0.55

*p <.05

Where : df = 2.50; critical F .05 value = 3.18

$PE_{(1+4)}$ = TR 1 (picture only, English evaluation) plus
TR 4 (picture only, Spanish evaluation)

$PE_{(2+5)}$ = TR 2 (picture and words, English evaluation) plus
TR 5 (picture and words, Spanish evaluation)

$PE_{(3+6)}$ = TR 3 (words only, English evaluation) plus
TR 4 (words only, Spanish evaluation)

Hypothesis 2. Spanish dominant bilingual learners who receive an English audio-slide presentation containing different levels of pictorial elaboration with an English evaluative test will obtain significantly greater achievement means on the four criterion measures than Spanish dominant bilingual learners who receive the identical presentation but given a Spanish evaluative test.

Main effects due to language of evaluation or subsequent factor interaction were found not to be significant. This implied that the language of evaluation did not significantly affect performance on any of the individual task tests. Thus, Hypothesis 2 was not supported.

Hypothesis 3. Spanish dominant bilingual learners who receive an English audio-slide presentation containing different levels of pictorial elaboration will obtain significantly greater means on the test measures that require more visual retrieval than those test measures that require verbal retrieval.

The addition of pictorial elaboration to the English audio narration during instruction did not produce the significantly greater mean achievement scores for the more visual than verbal retrieval tasks for each pictorial elaboration condition. Rather, as the main and post-hoc analyses indicate, significance is dependent upon type of pictorial elaboration (picture and word labels) and type of task (drawing test). It should be noted, however in the identification task test, a trend existed that also suggested that pictures and word labels were more effective than word labels alone or pictures alone in this more visual retrieval task.

The hypothesis for the learner time data (amount of total time spent interacting with all four task tests) was analyzed using a 2 x 3 factorial analysis of variance with subsequent post-hoc mean comparisons.

TABLE 3

ANALYSIS OF VARIANCE ON TIME CRITERION MEASURE FOR TREATMENT GROUPS

Source of Variation	df	Mean Square	F	Probability
Language of Evaluation (LE)	1	2063.20	11.85*	0.001
Pictorial Elaboration (PE)	2	848.21	4.87*	0.012
LE x PE	3	21.51	0.12	0.88
Residual	48	174.10		

*$p < .05$

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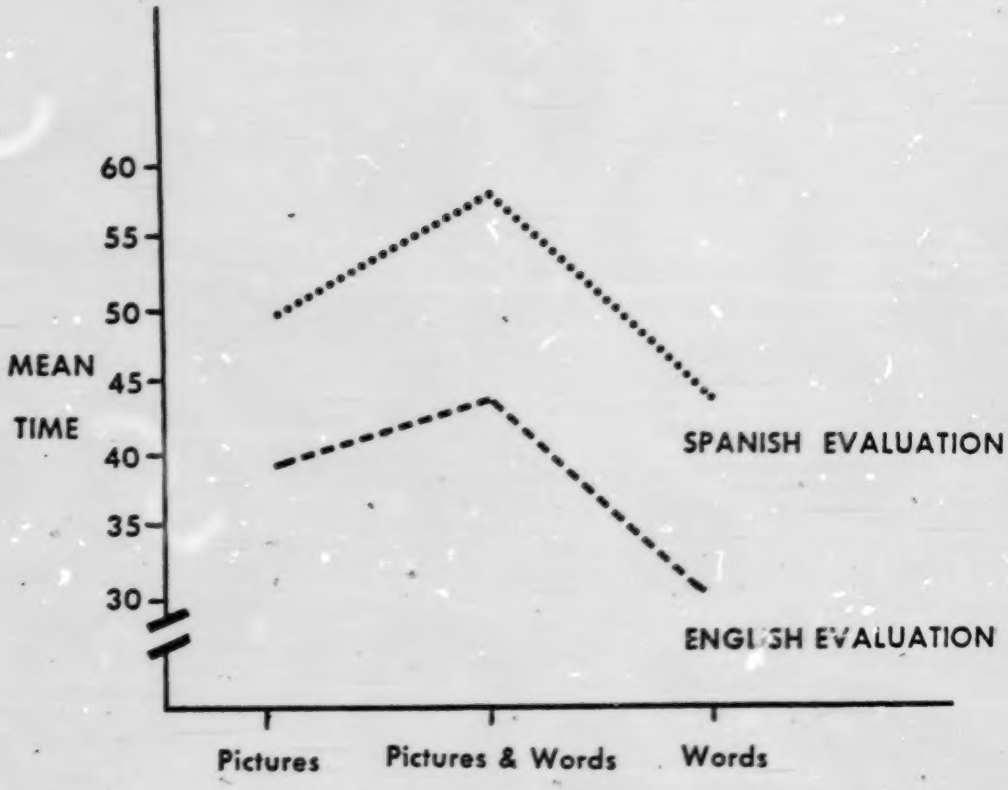

FIGURE 3 PLOT OF MEAN TIME VERSUS TYPE OF LANGUAGE OF EVALUATION FOR TYPE OF PICTORIAL ELABORATION

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TABLE 4

SCHEFFÉ'S MEAN TIME COMPARISONS FOR PICTORIAL ELABORATION

PE Mean Comparisons	Scheffé's F
$PE_{(1+4)}$ vs $PE_{(2+5)}$	0.36
$PE_{(1+4)}$ vs $PE_{(3+6)}$	1.19
$PE_{(2+5)}$ vs $PE_{(3+6)}$	3.14

*$p < .05$

Where: df = 2.50; critical F value = 3.18

$PE_{(1+4)}$ = TR 1 (picture only, English evaluation) plus TR 4 (picture only, Spanish evaluation)

$PE_{(2+5)}$ = TR 2 (pictures and words, English evaluation) plus TR 5 (pictures and words, Spanish evaluation)

$PE_{(3+6)}$ = TR 3 (pictures only, English evaluation) plus TR 6 (pictures only, Spanish evaluation)

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The factorial analysis represented in Table 3 and illustrated in Figure 3 is based upon the means and standard deviations for the treatment groups found in Appendix C.

Hypothesis 4. Spanish dominant bilingual learners who receive an English audio-slide presentation with different levels of pictorial elaboration with an English evaluative test will require a significantly smaller mean time to retrieve the information than Spanish dominant bilingual learners who receive an identical presentation but with a Spanish evaluative test.

Both the language of evaluation and pictorial elaboration had a significant effect on the total time required to complete the tests.

The main effect of language of evaluation indicates that those students who were given the evaluation in English performed significantly faster than those given the evaluation in Spanish. Post-hoc comparisons (Table 4) on the main pictorial elaboration effect, while not significant, suggested that those students given the word labels only presentation performed faster than those given the pictures only presentation or the pictures with word label presentation. While post-hoc comparisons failed to reach the specified level of significance, this could be partially explained in that the power of the post-hoc comparisons does not equal or exceed the power of the overall test of means.

Interpretation of the Findings

Discussion of Hypothesis 1

The finding that externally paced audio-slide English presentations with simple line drawings and word labels were more effective for the

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drawing task measure for bilingual learners (together with the same trend in the identification task measure) appears to be supportive of the contention that two referents during the acquisition of the desired concept facilitate the later retrieval of information in tasks requiring more visual information (Gropper, 1966). Other retrieval tasks requiring more verbal solution did not produce significant mean differences for different pictorial elaboration conditions, as has been generally found for monolingual subjects (Dwyer, 1972).

This finding also partially supports the cue summation theories (Black, 1962; Rappaport, 1957; Rosonke, 1974; Travers, 1969) which suggested that the addition of cues to instructional materials will provide increased achievement. However, this finding did not necessarily support the contention that learning does conform to a linear relationship which is dependent upon the number or complexity of the cues employed (Fitts, 1956; Vitz, 1966). Rather, the data suggested that the value of cues for instruction was highly dependent upon the retrieval task (Dwyer, 1972).

The finding that word labels only and pictures only were less effective than pictures and word labels was consistent with cognitive theories which maintain that if a learner does not previously have a set of codes (natural language mediators) to identify with, learning will not be enhanced (Paivio, 1971). By providing word labels in addition to the simple line drawings, the materials provided mediation enhancing the encoding or decoding strategies. Paivio (1971) contends that these two systems of processing information, images and verbal, would significantly enhance learning; the data

appears to support this contention for bilingual learners.

Since codes were provided in the picture and word label conditions, learners may have been better able to encode the more information-rich audio narration. Thus, it is possible that the visual presentation was a reinforcing element to the visualizing, locating, and associating of elements, initiating the construction of mental images and verbal associations.

The dual encoding of information, however, does not seem to produce any significant differences as the retrieval task becomes more sequential or verbal. In these criterion measures having two referents appears redundant to the task retrieval requirement.

Discussion of Hypothesis 2

The finding that retrieval recall or application was not significantly affected with the alteration of languages from instruction to testing was inconsistent with the stimulus generalization theories which suggested a significant effect for identical learning and testing materials (Hartman, 1961; Severin, 1967). If the results had been consistent with these theories, the bilingual student would have obtained better scores for an evaluation that was carried out in the same language of instruction (Fryetes, 1977). Pictures with word labels in English seemed to have facilitated the acquisition of English narrative information, but once the concept was acquired, the retrieval advantage of a specific language in testing became irrelevant. It should be noted that a Spanish presentation may alter this interpretation.

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Discussion of Hypothesis 3

Results and interpretation again reflect the interaction of pictorial elaboration with type of task test and subsequent post-hoc comparisons. As previously noted, achievement on the more visual tasks (drawing test and the trend noted for the identification test) was enhanced by the dual representation during presentation. Also, the opposite is possible-that pictures with word labels during presentation could have been distracters that affected achievement on the more verbal tasks during recall and application. This would tend to support the contention that higher order cognitive memory is more dependent upon the availability of a verbal code and not necessarily a visual one (Del Castillo & Gumenik, 1972).

Given this contention, it is possible that word labels only or pictures only might have made easier the coding of the verbal narrative information during presentation serving as natural language mediators in later verbal retrieval tasks which require more abstract and sequential information for solution rather than the more concrete and spatial.

Discussion of Hypothesis 4

The finding that language of evaluation does significantly affect the time required to complete the testing instrument is supportive of the theory of two independent linguistic systems and the dual system hypothesis for bilingual learners (Kolers, 1963; Paivio, 1971). The delay in completing the Spanish test was probably due to code-switching. Thus, the concept of a single storage area from which each language draws its responses was not supported since there was no immediate transfer (Kolers, 1963; Tulving &

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Colotla, 1970). The information appears to have been acquired in the language of presentation and more readily retrievable when the same language was available at task testing. Where the Spanish test required another processing step to derive the correct solution, MacNamara (1967) has indicated that this transfer may reflect a stage of relearning a second language. However, since the students had been exposed to English as a second language for at least twelve years, this seems less likely.

The results should emphasize that this code-switching process did not affect learner achievement; the cognitive requirement merely took longer to process and derive the correct solution. An alternative to investigate is that if students were provided practive or feedback during instruction, the results may be different.

The finding that bilingual students who received the presentation with word labels only performed faster on the evaluative test than the other groups may indicate that they had less coded information to access, particularly since their achievement scores were less.

Conclusions

If designers of externally paced visualized instruction and self-paced evaluation are to be responsive to the results of the empirical evidence, it would be important to give specific attention to the structure of different types of presentations in providing instructional content to bilingual learners. The selection of a specific method of pictorial elaboration appears dependent upon the learning and retrieval task involved.

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Specifically,as the self-paced retrieval task in testing requires more visual than verbal recall or application, simple line pictures with word labels during English instruction appear to enhance the Spanish dominant learner's achievement more than the pictures alone or word labels alone. Language of evaluation does not appear to be a relevant variable in relation to overall achievement, but does influence the amount of time necessary for completion of criterion measures. Specifically, self-paced English evaluation appears most efficient for Spanish dominant bilingual learners when instructed by externally paced English presentations.

Thus, this study indicates that when interaction is allowed with different types of pictorial elaboration during presentation of concepts, bilinguals will achieve different performance levels for different cognitive memory tasks.

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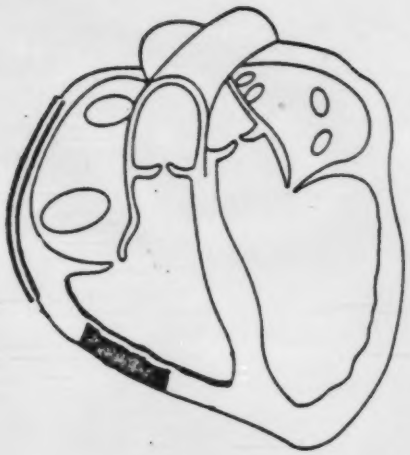
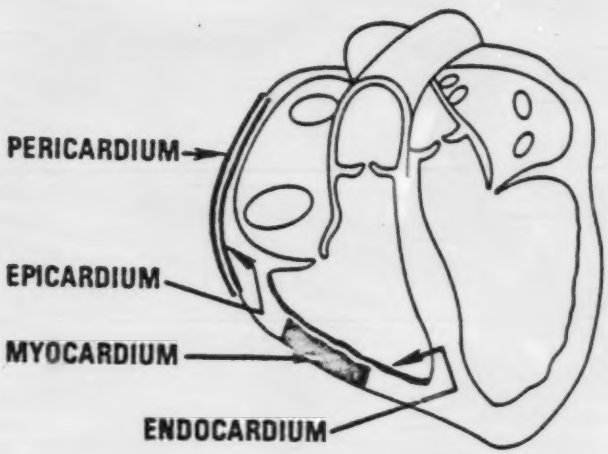
APPENDIX A

EXAMPLE OF PICTURES ONLY



EXAMPLE OF PICTURES & WORDS



EXAMPLE OF WORDS ONLY

PERICARDIUM

EPICARDIUM

MYOCARDIUM

ENDOCARDIUM

27

APPENDIX B

MEANS AND STANDARD DEVIATIONS OF CRITERION MEASURE SCORES FOR TREATMENT GROUPS

Treatment Groups (TR)	n	Indices	Task Tests			
			A	B	C	D
1	6	$\bar{X}$	6.00	9.33	4.67	5.67
		SD	6.42	4.41	3.01	2.88
4	10	$\bar{X}$	6.70	7.80	7.10	5.70
		SD	5.12	5.16	3.84	3.40
PE(Pictures)	16	$\bar{X}$	6.44	8.38	6.19	5.69
		SD	5.44	4.80	3.66	3.11
2	12	$\bar{X}$	10.25	10.75	6.58	6.42
		SD	4.43	3.82	3.53	3.45
5	8	$\bar{X}$	8.63	9.38	6.63	5.25
		SD	5.24	5.66	4.17	2.76
PE(Pictures + Words)	20	$\bar{X}$	9.60	10.22	6.60	5.95
		SD	4.71	4.55	3.69	3.17
3	7	$\bar{X}$	4.00	7.43	4.14	5.14
		SD	4.16	2.99	2.48	2.79
6	11	$\bar{X}$	7.73	8.73	6.82	7.82
		SD	4.36	4.82	4.07	4.07
PE(words)	18	$\bar{X}$	6.28	8.22	5.78	6.78
		SD	4.56	4.15	3.70	3.78

Note: where - TR1 = Picture only, English Evaluation
TR2 = Picture + Words, English Evaluation
TR3 = Words only, English Evaluation
TR4 = Picture only, Spanish Evaluation
TR5 = Picture + Words, Spanish Evaluation
TR6 = Words only, Spanish Evaluation

A = Drawing Task Test
B = Identification Task Test
C = Terminology Task Test
D = Comprehension Task Test

PE = Levels of Pictorial Elaboration

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APPENDIX C

MEANS AND STANDARD DEVIATION OF TIME FOR TREATMENT GROUPS

Language Evaluation (LE)	Indices	Pictorial Elaboration (PE)			Total (LE)
		Picture	Picture + Words	Words	
English					
	$\bar{X}$	39.17	43.42	30.43	38.76
	SD	13.03	11.93	3.55	11.61
	n	(6)	(12)	(7)	(25)
Spanish					
	$\bar{X}$	49.40	58.13	43.73	49.66
	SD	14.51	22.02	7.60	15.62
	n	(10)	(8)	(11)	(29)
(PE) Total					Grand Total
	$\bar{X}$	45.56	49.30	38.56	44.61
	SD	14.46	17.77	9.11	4.83
	n	(16)	(20)	(18)	(54)

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APPENDIX D

RELIABILITY FIGURES FOR THE INDIVIDUAL TASK TESTS

Indices	Task Tests			
	Drawing	Identification	Terminology	Comprehension
Mean	7.56	9.00	6.20	6.15
Standard Deviation	5.05	4.51	3.63	3.34
High Score*	17	18	18	16
Low Score*	0	2	1	2
Hoyt's	0.86	0.80	0.69	0.58
Standard Error	1.81	1.87	1.90	1.95

*Total number of possible scores in each task test is 20 points.

Note: Total number of individuals taking tests was 54 subjects.

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